

CONTENTS.

PAPERS.

NO.	MONTH.		PAGE.
CCXIV.	(January.)	The Strongest of the Bronzes: a newly discovered Alloy of Maximum Strength. Read January 5, 1881.—ROBERT H. THURSTON.....	1
CCXV.	(do.)	Renewal of the Foundation and Transfer of a Light House in Pascagoula Harbor. Read December 1, 1880.—J. W. PUTNAM.....	14
....	(do.)	Discussion on Paper CCX. Web Strains in Simple Trusses. Presented February 2, 1881.—SQUIRE WHIPPLE.....	20
CCXVI.	(February.)	The Sewerage of Memphis. Read November 3, 1880.—F. S. ODELL.....	23
....	(do.)	Discussion on the Sewerage of Memphis: By EDWARD S. PHILBRICK..... 32, 42 By J. JAMES R. CROES..... 34, 41, 42, 44 By GEORGE W. DRESSER..... 36, 44, 45 By ROBERT CARTWRIGHT..... 37, 42, 44 By SAMUEL L. SMEDLEY..... 39, 44 By WILLIAM E. WORTHEN..... 40 By ASHBEL WELCH..... 43 By JOHN BOGART..... 43 By GEORGE E. WARING, JR..... 45	
CCXVII.	(March.)	On the Ventilation of Halls of Audience. Presented January 26, 1881.—ROBERT BRIGGS.....	53
CCXVIII.	(April.)	On the Construction of the Second Avenue Line of the Metropolitan Elevated Railway of New York. Read April 20, 1881.—G. THOMAS HALL.....	107
CCXIX.	(do.)	Exponent of the Principle of Moments. Read March 2, 1881.—W. S. AUCHINCLOSS.....	135

II

No.	MONTH.		PAGE.
CCXX.	<i>May.</i>	Wind Pressure upon Bridges. Read December 15, 1880.—C. SHALER SMITH.....	139
.....	<i>(do.)</i>	Discussion on Wind Pressure upon Bridges: By CHARLES DOUGLAS FOX..... By ROBERT E. JOHNSTON..... By G. BOUSCAIRE..... By WILLARD S. POPE..... By JOSEPH M. WILSON..... By A. GOTTLIEB..... By D. J. WHITTEMORE..... By A. S. C. WURTELE..... By CHARLES A. SMITH..... By ROBERT FLETCHER..... By O. CHANUTE.....	150 151 154 158 160 161 162 164 164 165 169
CCXXI.	<i>(do.)</i>	An Examination into the Method of Determining Wind Pressures. Read April 6, 1881.—F. COLLINGWOOD.....	172
.....	<i>(do.)</i>	Discussion on an Examination into the Method of Determining Wind Pressures: By WILLIAM E. WORTHEN.....	185
CCXXII.	<i>(June.)</i>	Annual Address. Read at the Thirteenth Annual Convention, June 15, 1881.—JAMES B. FRANCIS.....	187
CCXXIII.	<i>(July)</i>	The Re-enforcement of the Anchorage and Renewal of the Suspended Structure of the Niagara Railroad Suspension Bridge. Presented June 15, 1881.—L. L. BUCK.....	195
CCXXIV.	<i>(do.)</i>	The Flow of the Sudbury River, Massachusetts, for the years 1875 to 1879. Presented November 3, 1879.—ALPHONSE FTILEY.....	225
.....	<i>(do.)</i>	Discussion on Rainfall and the Flow of Streams: By J. JAMES R. CROES..... By ASHBEL WELCH..... By F. COLLINGWOOD..... By JOSEPH P. DAVIS..... By CLEMENS HERSCHEL..... By MARSHALL M. TIDD..... By WILLIAM R. HUTTON..... By GEORGE W. DRESSER..... By SAMUEL L. SMEDELEY..... By JULIUS E. HILGARD..... By THOMAS C. CLARKE..... By OCTAVE CHANUTE..... By CHARLES E. EMERY..... By ALFRED G. COMPTON.....	235, 236, 238, 241, 243, 247, 250 236, 237, 241, 243, 244, 247 237, 241 237, 239 238 239 241, 249 243 244 244, 246 244 245, 247 245 249
CCXXV.	<i>(August.)</i>	Comparative Economy of Steel Rails with Light and Heavy Heads. Read June 15, 1881.—ASHBEL WELCH.....	251
CCXXVI.	<i>(do.)</i>	Quicksand in Excavation. Read May 18, 1881.—CHARLES L. MCALPINE.....	275
.....	<i>(do.)</i>	Discussion on Quicksand in Excavation: By WILLIAM R. HUTTON.....	286

III

No.	MONTH.		PAGE.
CCXXVII.	(September.)	Repairs of Masonry.	
		Read June 15, 1881.—OCTAVE CHANUTE.....	291
CCXXVIII.	(do.)	Strength and Ductility of the Copper-Tin-Zinc Alloys.	
		Presented June 17, 1881.—ROBERT H. THURSTON.....	309
CCXXIX.	(October.)	Shaft Sinking under Difficulties at Dorchester Bay Tunnel, Boston, Mass.	
		Read September 21, 1881.—D. MC. N. STAUFFER.....	343
CCXXX.	(November.)	Sewerage Systems.	
		Read June 15, 1881.—RUDOLPH HERING.....	361
....	(do.)	Discussion on Sewerage Systems: By CHARLES E. FOWLER	384
CCXXXI.	(December.)	On Uniform Standard Time, for Railways, Telegraphs, and Civil Purposes generally.	
		Presented June 15, 1881.—SANDFORD FLEMING.....	387

ILLUSTRATIONS.

PLATE.	MONTH.		PAPER.	PAGE.
.....	(January.)	Cuts Illustrating the Strongest of the Bronzes...	CCXIV.	2, 3
.....	(do.)	Map of Copper-Tin-Zinc Alloys.....	CCXIV.	6
		do. do. do.	CCXIV.	7
I.	"(do.)	Autographic Strain Diagram of Bronzes.....	CCXIV.	12
II.	(do.)	Map of Pascagoula Harbor Entrance.....	CCXV.	16
III.	(do.)	Details of Lighthouse Foundation.....	CCXV.	18
IV.	(February.)	Field's Automatic Flush Tank.....	CCXVI.	30
V.	(March.)	Fan for Ventilation.....	CCXVII.	97
VI.	(do.)	do. do.	CCXVII.	98
VII.	(do.)	Ventilating Tower.....	CCXVII.	100
VIII.	(April.)	Map of New York City showing lines of Elevated Railroads.....	CCXVIII.	107
IX.	(do.)	Standard Street Pier Metropolitan Elevated R.R.	CCXVIII.	110
X.	(do.)	Standard Sidewalk Pier do. do. do.	CCXVIII.	111
XI.	(do.)	Foundation for Column do. do. do.	CCXVIII.	112
XII.	"(do.)	do. do. do. do. do.	CCXVIII.	114
XIII.	(do.)	do. do. do. do. do.	CCXVIII.	116
XIV.	(do.)	do. do. do. do. do.	CCXVIII.	118
XV.	(do.)	Basics of Columns do. do. do.	CCXVIII.	120
XVI.	(do.)	Fenders for Columns do. do. do.	CCXVIII.	122
XVII.	(do.)	Movable Derrick do. do. do.	CCXVIII.	123
XVIII.	(do.)	Traveler and Structure do. do. do.	CCXVIII.	124
XIX.	(do.)	Sections of Track do. do. do.	CCXVIII.	128
XX.	(do.)	Crossing do. do. do.	CCXVIII.	130
XXI.	(do.)	Base and Pier do. do. do.	CCXVIII.	133
XXII.	(do.)	Profile of Second Avenue Line do. do.	CCXVIII.	134
XXIII.	(do.)	Averaging Machine; Exponent of the Principle of Moments.....	CCXIX.	138
.....	(May.)	Sketches Illustrating Wind Pressure upon Bridges.....	CCXX.	146
.....	(do.)	Illustration showing General Movements of a Tornado.....	CCXX.	154
.....	(do.)	Cut Illustrating Pressure on Car.....	CCXX.	155
.....	(do.)	Skeleton Piers.....	CCXX.	157
.....	(do.)	Sketch of Bridge Chords.....	CCXX.	163

PLATE.	MONTH.		PAPER.	PAGE.
XXIV.	(July.)	Illustrating Niagara Suspension Bridge.....	CXXXIII.	208
XXV.	(do.)	do. do. do.	CCXXXIII.	216
XXVI.	(do.)	do. do. do.	CCXXXIII.	218
XXVII.	(do.)	do. do. do.	CCXXXIII.	220
XXVIII.	(do.)	do. do. do.	CCXXXIII.	222
XXIX.	(do.)	do. do. do.	CCXXXIII.	224
XXX.	(do.)	Flow of Sudbury River, 1875.....	CCXXXIV.	228
XXXI.	(do.)	do. do. 1876.....	CCXXXIV.	228
XXXII.	(do.)	do. do. 1877.....	CCXXXIV.	228
XXXIII.	(do.)	do. do. 1878.....	CCXXXIV.	228
XXXIV.	(do.)	do. do. 1879.....	CCXXXIV.	228
XXXV.	(do.)	Position of Points of Observation, Sudbury River	CCXXXIV.	230
XXXVI.	(do.)	Self Registering Apparatus,	CCXXXIV.	232
XXXVII.	(do.)	Diagram from Self Registering Apparatus, Sud-	CCXXXIV.	234
		bury River.....	CCXXXIV.	240
XXXVIII.	(do.)	Flow from Horn Pond.....	CCXXXV.	266
XXXIX.	(August.)	Profile of Savings by Increasing Depth of Head	CCXXXV.	268
		of Rail.....	CCXXXV.	270
XL.	(do.)	Profile of Savings by Increasing Depth of Head	CCXXXV.	272
		of Rail.....	CCXXXV.	274
XLI.	(do.)	Profile of Savings by Increasing Depth of Head	CCXXXVI.	282
		of Rail.....	CCXXXVI.	293
XLII.	(do.)	Profile of Savings by Increasing Depth of Head	CCXXXVII.	295
		of Rail	CCXXXVII.	297
XLIII.	(do.)	Profile of Savings by Increasing Depth of Head	CCXXXVII.	298
		of Rail.....	CCXXXVII.	300, 1
.....	(do.)	Cut showing Excavation in Quicksand.....	CCXXXVII.	302, 3
.....	September.)	Portage Bridge.....	CCXXXVII.	304
.....	(do.)	Warsaw Culvert.....	CCXXXVII.	306
.....	(do.)	Clifton Culvert.....	CCXXXVIII.	313
.....	(do.)	Bergen Tunnel.....	CCXXXVIII.	317
.....	(do.)	Broken and Repaired Culverts.....	CCXXXIX.	322
.....	(do.)	do. do.		
.....	(do.)	West Paterson Bridge.....	CCXXXIX.	356
.....	(do.)	Blauveltville Arch.....	CCXXXIX.	360
.....	(do.)	Figure illustrating Copper-Tin-Zinc Alloys.....	CCXXXI.	394
XLIV.	(October.)	Profile of Dorchester Bay Tunnel.....		
XLV.	(do.)	Bulkhead and Apparatus; Shaft of Dorchester		
		Bay Tunnel.....		
XLVI.	(do.)	Cylinder and Shaft; Dorchester Bay Tunnel....		
XLVII.	(December.)	Plate Illustrating Uniform Standard Time.....		